

WHAT IS CLAIMED IS:

1. An electronic watermark embedding device including an electronic watermark pattern embedding unit that embeds an electronic watermark pattern in input image or video data, said electronic watermark embedding device further comprising:

displacement information pattern embedding means for embedding a displacement information pattern, which is produced in advance, in an image or video having the electronic watermark pattern embedded therein, and transmitting the resultant image or video.

2. An electronic watermark embedding device according to claim 1, wherein said displacement information pattern embedding means includes a displacement information pattern storage unit in which displacement information patterns are stored, and a displacement information pattern embedding unit for embedding the displacement information pattern, which is stored in the displacement information pattern storage unit, in the image or video having the electronic watermark pattern embedded therein.

3. An electronic watermark embedding device according to claim 2, wherein the displacement information pattern has a plurality of displacement information items arranged with a predetermined distance between adjoining displacement information items, and the displacement information items resist enlargement or reduction.

4. An electronic watermark embedding device according to claim 1, further comprising image analyzing means for

analyzing the input image or video to determine an embedding intensity level of the electronic watermark pattern to be embedded, in units of a pixel of the image or video, wherein said electronic watermark pattern embedding unit and said displacement information pattern embedding means embed the electronic watermark pattern and the displacement information pattern, respectively, according to the embedding intensity level determined by said image analyzing means.

5. An electronic watermark embedding device including an electronic watermark pattern embedding unit that embeds an electronic watermark pattern in input image or video data, said electronic watermark embedding device further comprising:

displacement information pattern embedding means for embedding a displacement information pattern, which is produced in advance, in an image or video having the electronic watermark pattern embedded therein, and transmitting the resultant image or video; and

image analyzing means for analyzing the input image or video to determine an embedding intensity level of the electronic watermark pattern to be embedded, in units of a pixel of the image or video, wherein said electronic watermark pattern embedding unit and said displacement information pattern embedding means embed the electronic watermark pattern and the displacement information pattern, respectively, according to the embedding intensity level determined by said image analyzing means.

6. An electronic watermark embedding device including an electronic watermark pattern embedding unit that embeds an electronic watermark pattern in input image or video data, said electronic watermark embedding device further comprising:

displacement information pattern embedding means for embedding a displacement information pattern, which is produced in advance, in an image or video having the electronic watermark pattern embedded therein, and transmitting the resultant image or video; and

image analyzing means for analyzing the input image or video to determine an embedding intensity level of the electronic watermark pattern to be embedded, in units of a pixel of the image or video, wherein said electronic watermark pattern embedding unit and said displacement information pattern embedding means embed the electronic watermark pattern and the displacement information pattern, respectively, according to the embedding intensity level determined by said image analyzing means;

said displacement information pattern embedding means including a displacement information pattern storage unit in which displacement information patterns are stored, and a displacement information pattern embedding unit for embedding the displacement information pattern, which is stored in the displacement information pattern storage unit, in the image or video having the electronic watermark pattern embedded therein.

7. An electronic watermark detecting device for detecting an electronic watermark pattern embedded in image

or video data, said electronic watermark detecting device comprising:

calculating means for calculating a scale of enlargement or reduction, on which the image or video is enlarged or reduced, according to a displacement information pattern embedded in the image or video data together with the electronic watermark pattern;

enlargement/reduction means for enlarging or reducing the image or video on the scale of enlargement or reduction calculated by said calculating means; and

detecting means for detecting the electronic watermark pattern in the image or video enlarged or reduced by said enlargement/reduction means.

8. An electronic watermark detecting device according to claim 7, wherein said calculating means includes:

a coordinate calculating unit for outputting coordinate data based on which one block is cut out of the image or video, and outputting an end signal that indicates the completion of cutting out a block of a predetermined range;

a block cutting unit for cutting out one block from the image or video according to the coordinate data;

a displacement information pattern storage unit in which displacement information patterns are stored;

an inner product calculating unit for calculating an inner product of the one block cut out and the displacement information pattern stored in said displacement information pattern storage device;

a maximum inner product buffer unit composed of a plurality of maximum inner product buffers associated with

positions at which displacement information items are embedded;

a maximum inner product judging unit for comparing the result of inner product calculation with information read from said maximum inner product buffer unit, said maximum inner product judging unit receiving coordinate data from said coordinate calculating unit, said maximum inner product judging unit outputting the result of inner product calculation and the coordinates, which indicate the position of the one block cut out, as the results of judgment when the result of comparison reveals that the result of inner product calculation is larger, and said maximum inner product judging unit replacing a value in an associated maximum inner product buffer included in said maximum inner product buffer unit with the result of inner product calculation;

an end-of-retrieval range judging unit for outputting a signal, which indicates completion, in response to the end signal received from said coordinate calculating unit, and for, when cutting out a block of the predetermined range is not completed, outputting an instruction signal, which is used to instruct output of coordinates indicating the position of another block to be cut out, to said coordinate calculating unit; and

a scale-of-enlargement/reduction judging unit for calculating a ^{Scale of enlargement or reduction} ~~scale of enlargement or reduction~~ according to information ^{read from said maximum inner product} ~~read from said maximum inner product~~ buffer unit in response to the received signal that indicates completion.

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9. An electronic watermark detecting device according to claim 7, wherein the displacement information pattern has a plurality of displacement information items arranged with a predetermined distance between adjoining displacement information items, and the displacement information items resist enlargement or reduction.

10. An electronic watermark detecting device according to claim 7, wherein said enlarging/reducing means converts the resolution of an image or video, which is enlarged or reduced after having the electronic watermark pattern embedded therein, into the resolution attained immediately after the image or video has the electronic watermark pattern embedded therein.

11. An electronic watermark detecting device for detecting an electronic watermark pattern embedded in image or video data, said electronic watermark detecting device comprising:

calculating means for calculating a scale of enlargement or reduction, on which the image or video is enlarged or reduced, according to a displacement information pattern embedded in the image or video data together with the electronic watermark pattern;

enlargement/reduction means for enlarging or reducing the image or video on the scale of enlargement or reduction calculated by said calculating means; and

detecting means for detecting the electronic watermark pattern in the image or video enlarged or reduced by said enlargement/reduction means;

said calculating means including:

a coordinate calculating unit for outputting coordinate data based on which one block is cut out of the image or video, and outputting an end signal that indicates the completion of cutting out a block of a predetermined range;

a block cutting unit for cutting out one block from the image or video according to the coordinate data;

a displacement information pattern storage unit in which displacement information patterns are stored;

an inner product calculating unit for calculating an inner product of the one block cut out and the displacement information pattern stored in said displacement information pattern storage device;

a maximum inner product buffer unit composed of a plurality of maximum inner product buffers associated with positions at which displacement information items are embedded;

a maximum inner product judging unit for comparing the result of inner product calculation with information read from said maximum inner product buffer unit, said maximum inner product judging unit receiving coordinate data from said coordinate calculating unit, said maximum inner product judging unit outputting the result of inner product calculation and the coordinates, which indicate the position of the one block cut out, as the results of judgment when the result of comparison reveals that the result of inner product calculation is larger, and said maximum inner product judging unit replacing a value in an associated maximum inner product buffer included in said maximum inner

product buffer unit with the result of inner product calculation;

an end-of-retrieval range judging unit for outputting a signal, which indicates completion, in response to the end signal received from said coordinate calculating unit, and for, when cutting out a block of the predetermined range is not completed, outputting an instruction signal, which is used to instruct output of coordinates indicating the position of another block to be cut out, to said coordinate calculating unit; and

a scale-of-enlargement/reduction judging unit for calculating a scale of enlargement or reduction according to information read from said maximum inner product buffer unit in response to the received signal that indicates completion.

12. An electronic watermark embedding method for embedding an electronic watermark pattern in input image or video data, said electronic watermark embedding method comprising the step of:

embedding a displacement information pattern, which is produced in advance, in the image or video having the electronic watermark pattern embedded therein, and transmitting the resultant image or video.

13. An electronic watermark embedding method according to claim 12, wherein said displacement information pattern has a plurality of displacement information items arranged with a predetermined distance between adjoining displacement information items, and the displacement information items resist enlargement or reduction.

14. An electronic watermark embedding method according to claim 12, further comprising a step of analyzing the input image or video to determine an embedding intensity level of the electronic watermark pattern to be embedded, in units of a pixel of the image or video, wherein the electronic watermark pattern and the displacement information pattern are embedded based on the determined embedding intensity level.

15. An electronic watermark embedding method for embedding an electronic watermark pattern in input image or video data, said electronic watermark embedding method comprising the step of:

embedding a displacement information pattern, which is produced in advance, in the image or video having the electronic watermark pattern embedded therein, and transmitting the resultant image or video; and

analyzing the input image or video to determine an embedding intensity level of the electronic watermark pattern to be embedded, in units of a pixel of the image or video, wherein the electronic watermark pattern and the displacement information pattern are embedded based on the determined embedding intensity level.

16. An electronic watermark detecting method for detecting an electronic watermark pattern embedded in input or video data, said electronic watermark detecting method comprising the steps of:

calculating a scale of enlargement or reduction, on which the image or video is enlarged or reduced, according to a displacement information pattern embedded in the image

or video data together with the electronic watermark pattern;

enlarging or reducing the image or video on the calculated scale of enlargement or reduction; and

detecting the electronic watermark pattern in the enlarged or reduced image or video.

17. An electronic watermark detecting method according to claim 16, wherein the displacement information pattern has a plurality of displacement information items arranged with a predetermined distance between adjoining displacement information items, and the displacement information items resist enlargement or reduction.

18. An electronic watermark detecting method according to claim 16, wherein said step of enlarging or reducing the image or video includes a step of converting the resolution of the image, which is enlarged or reduced after having the electronic watermark pattern embedded therein, into the resolution attained immediately after the image has the electronic watermark pattern embedded therein.

19. An electronic watermark detecting method for detecting an electronic watermark pattern embedded in input or video data, said electronic watermark detecting method comprising the steps of:

calculating a scale of enlargement or reduction, on which the image or video is enlarged or reduced, according to a displacement information pattern embedded in the image or video data together with the electronic watermark pattern;

enlarging or reducing the image or video on the calculated scale of enlargement or reduction; and detecting the electronic watermark pattern in the enlarged or reduced image or video;

said step of enlarging or reducing the image or video including a step of converting the resolution of the image, which is enlarged or reduced after having the electronic watermark pattern embedded therein, into the resolution attained immediately after the image has the electronic watermark pattern embedded therein.